# REVISED AND ADDITIONAL GEOCENTRIC COÖRDINATES OF SEISMOLOGICAL STATIONS.

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The authors have included in a recent paper [Gerl. Beitr. Geophys. **40** (1933) 380] a list of selected seismological stations with carefully verified coördinates, including geocentric latitudes and heights above an arbitrary sphere. Comparison with the publication by K. E. BULLEN (The Constants of Seismological Observatories, 1933) revealed certain discrepancies, which have been investigated by direct correspondence with the stations concerned. In the interval a few stations have removed to new positions, or have themselves revised their published coördinates, and other new installations have been made which justify the inclusion of additional stations in a selected list.

Corrections, changes, and additions are listed in Tables 1, 2 and 3 respectively; corrections and changes are printed in heavy type, but complete data are given for each station.

In the previous paper asterisks were attached to all items not received directly from the stations themselves, or from official sources connected with the stations. Many of these refer to height above sea level, and are attached to that datum alone; where the asterisk follows the name of the station, it applies to all the station data. Receipt of further information now permits the asterisk to be removed from the entries for the following stations:

Çarloforte, De Bilt, Chur, Graz, Halifax, Ivigtut, Kôbe, Lund, Neuchâtel, Perth, Port au Prince, Potsdam, Praha, San Fernando, Strasbourg, Sumoto, Tortosa, Zürich.

Table 1. Corrections.

| Geographic Latitude $\beta$ | Height above sea level $h$ in km. | Station | Longitude (Greenwich) $\lambda$ | Geocentric Latitude $\alpha$ | Height above (+) or under (—) sphere with $r = 6366$ km. $H$ in km. |
|---|---|---|---|---|---|
| ° ′ | | | ° ′ | ° ′ | |
| **13 28** N | 0.0 | Agaña (Guam) | **144 45** E | **13 23** N | + 11 |
| 42 30 N | **0.2** | Harvard University | 71 34 W | 42 19 N | 2 |
| 48 49 N | **0.0** | Paris (Parc St. Maur) | 2 30 E | 48 37 N | 0 |
| 20 48 N | **0.1** | Phu Lien | 106 38 E | 20 41 N | 10 |
| 39 32 | 1.4 | Reno | **119 49** | 39 21 | 5 |
| **33 26** S | 0.6 | Santiago de Chile | **70 39** W | **33 15** S | 6 |
| 52 08 N | 0.5 | Saskatoon | **106 38** W | 51 57 N | — 1 |
| **18 09** S | 0.0 | Suva | **178 26** E | **18 02** S | + 10 |

Table 2. Changes.

| | | | | | |
|---|---|---|---|---|---|
| **37 11** N | 0.8 | Cartuja | 3 36 W | **37 00** N | 5 |
| **39 53** N | 0.5 | Toledo | 4 03 W | **39 41** N | 4 |
| 43 07 N | **0.1** | Vladivostok | **131 54** E | 42 56 N | 2 |

Table 3. Additions.

| | | | | | |
|---|---|---|---|---|---|
| 47 33 N | 0.3 | Basel | 7 35 E | 47 21 N | 0 |
| 44 29 N | 0.1 | Burlington | 73 12 W | 44 17 N | 1 |
| 14 40 N | 0.0 ? | Dakar* | 17 26 W | 14 34 N | 11 |
| 41 36 N | 0.3 | Des Moines | 93 41 W | 41 24 N | 3 |
| 50 53 N | 0.1 | Heerlen | 5 59 E | 50 43 N | — 1 |
| 42 27 N | 0.2 | Ithaca | 76 29 W | 42 16 N | + 2 |
| 48 11 N | 0.9 | Meszstetten-Ebingen | 8 58 E | 47 59 N | 1 |
| 22 37 S | 2.9 | Montezuma | 68 50 W | 22 29 S | 12 |
| 7 20 N | 0.0* ? | Palau | 134 29 E | 7 17 N | 12 |
| 39 58 N | 0.0 | Philadelphia | 75 11 W | 39 46 N | 3 |
| 5 24 S | 0.2 | Soengei Langka | 105 13 E | 5 22 S | 12 |
| 40 48 N | 0.4 | State College, Penna. | 77 52 W | 40 36 N | 3 |
| 35 32 N | 0.0 | Toyooka | 139 49 E | 35 21 N | 5 |
| 45 39 N | 0.0 | Trieste | 13 45 E | 45 27 N | 1 |

In the table as now revised, asterisks should remain as follows:

Applying to all station data:

Abisko, Bidston, Cardiff, Catania, Colombo, Dakar, Edinburgh, Entebbe, Heidelberg, Helsingfors, Johannesburg, Marseille, Melbourne, Milwaukee, Moncalieri, Sucre, Sydney.

Applying to height above sea level only:

Cape Town, Denton, Little Rock, Palau, Reykjavik, Tachkent, Tartu.

It is not believed that any of the data so marked are seriously in error, as all have been derived from reliable sources.

The following cases appear to require special comment:

Agaña — A letter from the Governor of Guam gives 13° 28′ 20.3″ N., 144° 44′ 55.9″ E., elevation 15 feet. A letter from the Director of the Manila station informs us that the coördinates given in our previous paper, which were taken from the Manila bulletin, refer to another point.

Alipore — A letter dated Dec. 21, 1934, from the Director-General of Observatories at Poona, gives 88° 20′ E. as the accepted value of the longitude of Calcutta, in reply to our request for the longitude of Alipore.

Andijan — A letter dated April 8, 1934, from P. NIKIFOROFF, confirms the coördinates as given in our previous paper. Other coördinates were given in the first bulletin issued for this station, but were corrected in all subsequent bulletins.

Cartuja — Since July, 1933, bulletins for this station give latitude 37° 10′ 43″, while older bulletins give 37° 12′. The station has been moved.

Graz — The correct latitude is 47° 04.6′, which for some time was misprinted in the station bulletin as 47° 46′.

Haiwee — In the first station bulletins the longitude was erroneously given as 117° 58.6′ W.; this should be 117° 57.9′ W.

Harvard — The old station at Cambridge (42° 23′ N., 71° 07′ W.) was replaced by the new station at Oak Ridge (42° 30′ N., 71° 34′ W.) on March 30, 1933.

Montezuma — The data given are correct according to the records of the U.S. Coast and Geodetic Survey.

Numadu — The correct latitude is 35° 06′ N., as in the station bulletin; the latitude 36° 06′ given by several authorities is a misprint.

Santiago de Chile — A letter from the Director, dated May 7, 1934, gives 33° 26′ 25″ S., 70° 38′ 55.5″ W. as the most exact coördinates available, according to determination by the National Astronomical Observatory.

Saskatoon — The correct longitude is 106° 38′, according to Dr. E. A. HODGSON. This was for some time misprinted as 106° 30′ in the bulletins issued from Ottawa.

Sofia — A letter from the Director, dated March 26, 1934, confirms the latitude as 42° 42′ N.

Spokane — This station was formerly at 47° 39′ N. 117° 28′ W., but was removed about 1931 to 47° 43′ 54″ N., 117° 20′ 39″ W.

Suva — The coördinates given in our previous paper are erroneous. The latitude and longitude now given agree with all authorities, and are confirmed in a letter from the Director at Wellington.

Toledo — A circular letter from the Director, dated May 1, 1935, states that from that date the station has been installed at the new Geophysical Observatory, with provisional coördinates 39° 52′ 53″ N., 4° 02′ 55″ W.

Victoria — A letter from the Director dated March 8, 1934, gives 48° 24′ 50.28″ N., 123° 19′ 27.78″ W.

Vladivostok — To the end of 1931, the coördinates are given in bulletins issued from Leningrad as 43° 7.4′ N., 131° 56′ 50″ E. From January, 1934, bulletins issued from Vladivostok give 43° 7′ 12″ N., 131° 53′ 34″ E., $h = 74.5$ m.

Zinsen — The longitudes given for this station by various authorities at various times show many small differences. The data as previously given correspond with the latest bulletins of the station.

We are very grateful to the directors of observatories and others who have coöperated with us in assembling these corrected data. We are especially indebted to Miss ETHEL F. BELLAMY, Dr. K. E. BULLEN, Dr. E. A. HODGSON, Commander N. H. HECK, and Mr. FRANK NEUMANN.

We shall much appreciate having our attention drawn to any remaining errors.